THROWMASTER™

CABLE TEST SET

MODEL 107

OPERATING PRACTICES

INTRODUCTION

This Booklet provides operating instructions on the Model 107 Throwmaster Cable Test Set. It is divided into two parts: (1) a General Description of the test set, and (2) a section on the Operation and Use of the test set. The format is similar to that used by many operating telephone companies for their own practices.

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THROWMASTER™ 107 CABLE TEST SET
DESCRIPTION AND OPERATION

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DESCRIPTION

1. GENERAL

1.01 This practice covers the description and operation of the Model 107 Throwmaster™ Cable Test Set. Throwmaster is a registered trademark of Industrial Technology, Inc.

1.02 The Throwmaster 107 is a compact, battery powered instrument intended for field testing of telephone cable pairs. The 107 is normally used by splicing technicians as their primary testing tool for sending tone, setting up talk circuits, testing working and nonworking pairs, testing for cable defects and locating faults. The other major use of the Throwmaster 107 is for performing cut closed cable transfers on working voice frequency circuits. These circuits can be metallic or derived from pair gain systems. The main difference between this model Throwmaster and previous models is its capability to buzz around through pair gain systems.

1.03 The Model 107 can be used to buzz around the following types of cable transfers:

1. Metallic to metallic
2. Metallic to pair gain
3. Pair gain to metallic
4. Pair gain to pair gain

The pair gain system can be SLC-96, DMS-1 Urban or other types of subscriber loop carrier. These systems may or may not be fed by fiber optic cables. Like other Throwmaster models, the 107 can be used to transfer any circuit that can be half tapped. This includes POTS circuits and many types of special circuits.

NOTE: The procedures described in this practice are generalized from many telephone company practices, however local telephone company practices should be followed when they differ from those recommended in this document.

1.04 Please note that the 107 is intended for use on the voice frequency or derived pair side of pair gain systems. It is not intended for use as a digital transfer system for such purposes as making section transfers in digital spans.

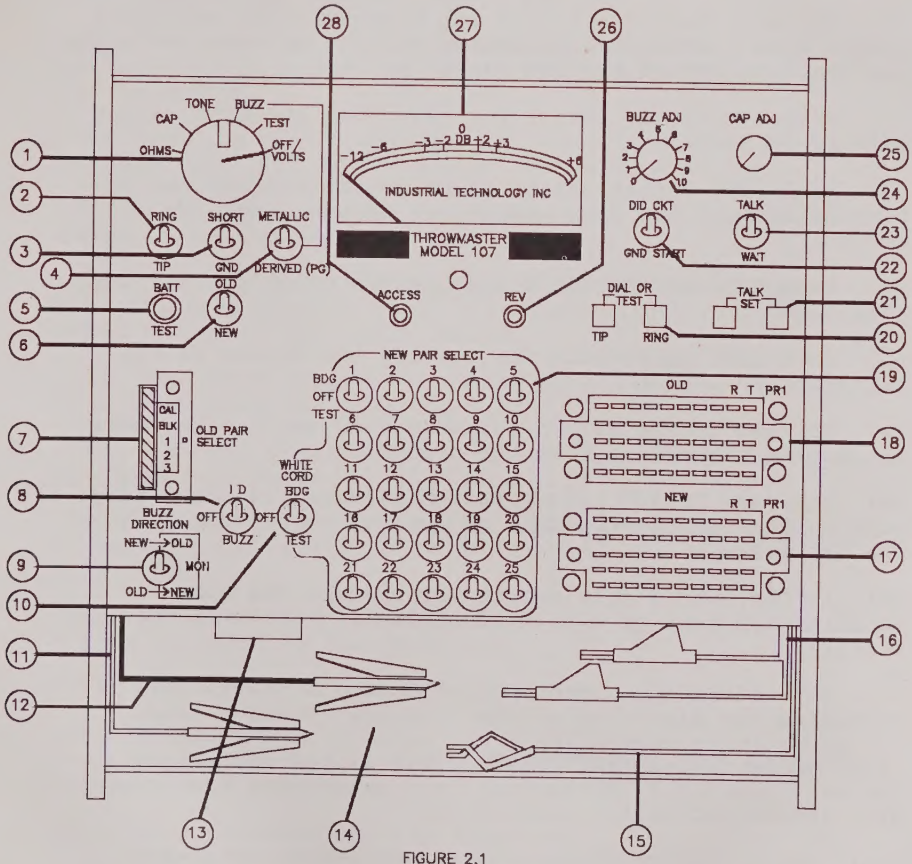
TONE
BUZZ
CAP
TEST
OHMS
OFF/VOLTS
RING
SHORT
METALLIC
TIP
GND
DERIVED (PG)
BATT
OLD
TEST
NEW
INDUSTRIAL TECHNOLOGY INC
THROWMASTER MODEL 107
ACCESS
REV
BUZZ ADJ
CAP ADJ
DID CKT
TALK
GND START
WAT
DIAL OR TEST
TALK SET
TIP
RING
NEW PAIR SELECT
BDG
OFF
TEST
WHITE CORD
OLD PAIR SELECT
CAL
BLK
BUZZ DIRECTION
NEW→OLD
OLD→NEW
MON
I D
BUZZ
OLD
R T PR1
NEW
R T PR1
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FIGURE 2.1

2. DESCRIPTION

2.01 The Throwmaster 107 has the following controls and components. Refer to Figure 2.1.

(1) The main function switch for selecting the operating mode. This switch is interlocked so that it must be in the off position before the lid can be closed.

(2) RING/TIP toggle switch for selecting the side of the pair to be tested.

(3) SHORT/GND toggle switch which determines whether the test is between the ring and tip or between one side and ground.

(4) METALLIC/DERIVED(PG) toggle switch which selects the buzz mode.

(5) BATT TEST pushbutton for testing the status of the batteries.

(6) OLD/NEW toggle switch for selecting whether the meter is testing the old pair or the new pair.

(7) OLD PAIR SELECT rotary switch selects the black cord, a pair in the old count module or the calibrate capacitor in the Cap mode.

(8) ID/OFF/BUZZ toggle switch which sends the buzz verification tone or a pair identification tone in a cable transfer.

(9) BUZZ DIRECTION-NEW>OLD/OLD>NEW toggle switch for selecting the direction of the buzz verification tone.

(10) WHITE CORD-BDG/OFF/TEST toggle switch for selecting the test positon or bridge position when using the single pair (black and white) test cords.

(11) White test cord for single pair cable transfers.

(12) Black test cord for single pair transfers and general testing.

(13) Built in speaker for confirming dial tone and buzz verification tone.

(14) Battery compartment and cord storage.

(15) Ground cord.

(16) Talk pair cord.

(17) Cinch 25 pair connector for connection of the new count module and for multi-pair testing.

(18) Cinch 25 pair connector for connection of the old count module and for multi-pair testing.

(19) NEW PAIR SELECT toggle switches (25) for selecting the new pair to be tested and for individually bridging the old and new pairs.

(20) DIAL OR TEST terminals for connection of a dial set or external test set to the old or new pair selected.

(21) TALK SET terminals for connection of a headset to communicate over the talk pair.

(22) DID CKT/GND START toggle switch used to activate direct inward dialing (DID) and ground start circuits for cable transfers and verification.

(23) TALK/WAIT toggle switch for selecting the talk or wait mode when using the talk circuit.

(24) BUZZ ADJ potentiometer for setting the meter reading for both Buzz modes.

(25) CAP ADJ potentiometer for calibrating the cap reading to measure the length of cable pairs or the distance to an open.

(26) REV red light emitting diode that flashes to indicate a pair reversal in the buzz mode.

(27) Flush mounted meter for all test readings.

(28) ACCESS green light emitting diode that comes on to indicate that access to the new pair has been achieved in the pair gain buzz mode.

(29) Also included but not shown are:
Nylon carrying strap with hook
Detachable lid with operating summary

2.02 Mechanical

The 107 Throwmaster is packaged in a solid aluminum case that has proven to be very long lasting in the field environment. All toggle switches have rubber covers that protect against dirt and moisture. The Cinch connectors are protected by a spring loaded cover, not shown in Figure 2.1.

3. SPECIFICATIONS

Dimensions: 10.5 X 11.0 X 4.5 inches
(267 X 280 X 114 mm)

Weights: Net 12 lbs. (5.5 kg)
Shipping 14 lbs. (6.4 kg)

Batteries: 5 - 9V Alkaline NEDA 1604
Rechargeable batteries can also be used.

Battery life: Typically >100 hours

Operating Temperature: 0 to 120°F
(-18 to 48°C)

Tone: 577 Hz precision tone, applied in
longitudinal(simplex),grounded or metallic mode.

Test Ranges: Voltmeter 0-100 VDC
Resistance 0-10 megohms
Length (capacitance) 0-100,000 feet
Buzz dynamic range 0 to -20 dBm

4. ORDERING INFORMATION

The 107 is ordered as follows:

Throwmaster Cable Test Set, Model 107

which includes batteries, operating manual and single pair test cords.

Optional accessories include :

1. 710 Cap Shoe Kit, Model 304
which contains two cap shoes for test access to 710 modules using holey caps. These are used for 25 pair cut closed cable transfers in a 710 type modular splice.

2. Test Cord, Model 311
which is a 25 pair general purpose test cord with a Cinch connector on one end. The other end is not terminated so that the user can install his own connector or splice module.

3. Section Throw Cord, Model 307
which is a special cord used in section replacement jobs that connects together a Throwmaster, an automatic pair identifier and a Switchmaster.

The Model 107 is also available as a conversion from the Model 106-25 Throwmaster. Contact the factory for details.

5. WARRANTY

IMPORTANT NOTICE TO PURCHASER

All statements, technical information and recommendations contained herein are based on information we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, expressed or implied.

Industrial Technology, Inc.'s only obligation shall be to repair, replace or adjust any Throwmaster that proves to be defective within one year after shipment to the original purchaser. Neither seller or manufacturer shall be liable for injury, loss or damage, direct or consequential, arising out of use of this product. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability in connection therewith. No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by officers of Industrial Technology, Inc.

6.SERVICE

6.01 For warranty repairs, the defective unit must be returned to:

Industrial Technology, Inc.
Repair Department
2001 FM 1821 South
Mineral Wells, Texas 76067

Equipment needing repair should be sent prepaid to this address with a written statement setting forth as completely as possible, the defects and the conditions under which they occurred.

6.02 For non-warranty repairs, we recommend that the unit be returned to the factory as described above for repair and a complete checkout.

6.03 For questions on service or operation, and requests for training, call Industrial Technology on (817) 325-9461, FAX (817) 325-CALL.

OPERATION

7. PURPOSE

7.01 As stated earlier the 107 Throwmaster is intended as a general purpose test set for the splicing technician. As such it can be used to send tone, set up talk circuits, measure voltages, perform field test board functions, troubleshoot working and nonworking lines, identify and locate cable faults, perform cable acceptance tests, check for the presence of ringers, and buzz around and bridge working pairs on in-service cable transfers.

7.02 On cable transfers, the 107 can be used on single pair to single pair transfers, single pair to module transfers and module to module transfers. In all cases the Throwmaster will verify that the correct circuits are half tapped, that they are not reversed and that no cable pair defects are present. Location of the subscriber's telephone can be checked in most cases and the pair can be bridged during the transfer to eliminate any service outage. As with other Throwmasters, any pair that can be half tapped can be thrown without service interruption. This includes POTS lines and many non-critical special circuits including four wire circuits.

CAUTION
Do not attempt to buzz or bridge any circuits that cannot be half tapped or any circuits that must be turned down to transfer. These circuits are usually identified on the throw sheets as requiring special handling. Also do not attempt to bridge digital lines. The 107 is intended for use on voice frequency lines only. Please follow local practices and procedures strictly when using this or any other test equipment.

7.03 Pair Gain Transfers
One of the major advantages of the Model 107 Throwmaster over other models is that it can be used to buzz or verify the voice frequency side of pair gain systems. In other words, the 107 will verify that the derived circuit out of a pair gain system is the correct one or the one that is half tapped in the central office. Not only will it verify that both the ring and tip sides of the derived pair are correct, but it will also verify that proper transmission levels are being maintained in both directions through the carrier system. The 107 will work on all known types of subscriber loop carrier systems including SLC-96, DMS-1 Urban and systems incorporating fiber optic segments.

7.04 The 107 will buzz through and verify the following types of cable transfers:

1. Metallic to metallic
2. Metallic to derived (pair gain)
3. Derived (pair gain) to metallic
4. Derived to derived (pair gain to pair gain)

7.05 Modular Transfers
Procedures for performing modular cable transfers vary depending on the type of module used. Follow the splicing module manufacturer's recommendations for making test connections and for the wire work involved in making a modular transfer.

7.06 The 107 model incorporates all the features found in the Model 106 and Model 106-25 and is a direct replacement for these units. The 107 contains the same buzz circuit found in the 106-25, plus having the derived(PG) capability.

8. BATTERY TEST AND REPLACEMENT

8.01 Battery tests
The 107 contains five 9V batteries. Four of these batteries are used to power the test circuitry and one is used for the talk circuit. To test the four main batteries, simply press the BATT TEST pushbutton and note the meter reading. A reading in the OK area indicates that the batteries are in good condition. To test the talk circuit battery, place the TALK/WAIT switch in WAIT and short the two talk pair (gray cord) clips together. A tone will be heard from the speaker if the talk battery is good. The talk circuit battery is also used for the DID circuit test.

8.02 Battery Replacement
To replace the batteries, remove the battery cover and replace them with similar new batteries. Alkaline batteries are recommended for long life. Replace all four of the test batteries if they test low. If desired the batteries can be replaced with rechargeable 9V rectangular batteries found in many electronics stores. These can then be recharged periodically using an external recharger.

9. SETTING UP A TALK PAIR

To set up a talk pair, connect the clips of the gray talk pair cord to a good vacant pair and connect a headset to the TALK SET terminals. If an identification tone is needed on the talk pair, connect the black test cord to the talk pair also and switch the function switch to TONE. The OLD/NEW switch should be in OLD and the OLD PAIR SELECT switch should be in BLK for tone to be sent on the black cord. If the TALK/WAIT switch is placed in WAIT, a tone will be heard from the speaker when the person at the other end places his

headset across the talk pair. When the wait tone is heard, switch from WAIT to TALK and the talk pair is established. Always leave the TALK/WAIT switch in TALK when the wait function is not being used.

Note: The Wait function will not operate when the set is in the OFF/VOLTS position.

10. CABLE PAIR ACCESS
The 107 can access cable pairs for testing using the single pair (black and white) test cords or the 25 pair connectors.

10.01 Single Pair Access
To connect the black (old pair) test cord to the test circuits, the OLD PAIR SELECT switch must be in the BLK position. Likewise the white (new pair) cord is only connected when the WHITE CORD-BDG/OFF/TEST switch is in the TEST position. The OLD/NEW switch is then used to select which pair is accessed for testing. The black cord is the primary test cord and is the one used for most testing purposes. The white cord is used only for cable transfers.

10.02 25 or 50 Pair Access
To connect to 25 or 50 pair for multi-pair testing, connect the appropriate test cord to the old and new connectors on the test set. Then to access a particular pair in the old count, switch the OLD PAIR SELECT switch to the pair number desired. To access a pair in the new count, press down one of the 25 NEW PAIR SELECT toggle switches. These switches are spring loaded in the test position so they must be held down for test access. Do not access more than one pair at a time as this would cross the pairs selected.

As in single pair testing the old or new pair is selected depending on the position of the OLD/NEW switch.

The 107 can be used to access 50 pair at one time by connecting the first 25 to the old connector and the second 25 to the new connector. Then the OLD PAIR SELECT is used for the first 25, and the NEW PAIR SELECT switches are used for the second 25 pair.

11. USING THE RING/TIP AND SHORT/GND SWITCHES

The RING/TIP and SHORT/GND switches determine how the test set looks at the pair selected in all operating modes, including VOLTS, TEST, BUZZ, TONE, CAP and OHMS. The RING/TIP switch selects the side of the pair being tested and the SHORT/GND switch selects whether the test is between the ring and tip of the pair or between one side and ground. If the SHORT/GND switch is in the GND position, the test is between one side and ground. If the switch is in the SHORT position, the test is between the ring and the tip. In this

case reversing the RING/TIP switch simply reverses the polarity of the test.

Example: If you are using the TEST mode and the RING/TIP switch is in RING, and the SHORT/GND switch is in SHORT, then the test meter is looking between the ring and tip sides of the pair selected. The meter will read any defects between the ring and the tip but will not respond to faults to ground. To look for ground faults, the SHORT/GND switch must be switched to GND.

NOTE: WHEN SETTING UP THE 107 FOR USE, ALWAYS START WITH THE RING/TIP AND SHORT/GND SWITCHES IN THE UP POSITION.

12. MEASURING VOLTAGES

With the function switch in the VOLTS position, the 107 meter reads DC voltages in the 0 to 100 volt range. A full scale (100) reading on the meter means 100 volts. The voltmeter reads DC voltages only and will not respond to AC voltages. Refer to paragraph 11 for how the voltmeter is connected to the pair.

13. SENDING TONE

13.01 The 107 can be used to send a precision 577 Hz identification tone on a cable pair in two ways:

(1) Simplex - which is a tone applied to both sides of the pair with respect to ground. This tone is not normally audible to the subscriber because there is no voltage difference between the ring and the tip. Simplex tone can be picked up with ordinary amplifiers and is recommended for use on all lines including many special circuits.

(2) Grounded - which is applied on one side of the pair with respect to ground. Grounded tone is audible to the subscriber so it should not be used on busy lines or special circuits.

13.02 Sending Simplex Tone
To send a simplex tone place the RING/TIP and SHORT/GND switches in the up position and switch the function switch to the TEST position. Note the meter reading. On working lines the meter will read at the R, T or BUSY marks. A zero reading means that the pair is non-working or the test cord is not making contact on one or both sides. Do not switch to TONE unless both sides of the test cord are making contact with the pair. Switch to TONE and use an amplifier to pick up the tone at the other location. After the pair is found, the pair may be shorted or grounded if it is not in use to confirm that the correct pair has been found. In the 107 the meter will read the same in TONE as it does in TEST without changing positions of the function switch.

Note: Simplex tone will not be carried by a carrier system except between repeaters. Refer to 20.05 for sending tone through pair gain systems.

13.03 Sending Grounded Tone
The same procedure is used to send a grounded tone except the SHORT/GND switch is placed in the GND postion, and the RING/TIP switch selects the side on which tone is sent. DO NOT USE THE GROUNDED TONE ON BUSY OR SPECIAL CIRCUITS.

14. USING THE TEST FUNCTION

14.01 The TEST function in the 107 is the same as the TEST/1-2 AND THE 1-2 function in earlier Throwmaster models, except that in the 107 the test voltage is a regulated 100 volts instead of a variable 112 volts. In the 107, the meter readings in the TEST mode are more stable over time than in other models.

14.02 Testing Working Pairs
The 100 volt battery in the 107 opposes the voltage on the pair being tested so a 50 volt line will read 100-50 or 50 volts on the meter. This point on the meter is marked with a R which indicates the normal reading on the ring side of a working telephone line. Similarly a T mark shows where the tip side normally reads. The T mark is at full scale (100) because the tip side is normally at ground potential on an idle line. If the line is busy the meter will read between the R and T marks in the area marked BUSY. The exact reading will depend on distance from the central office or battery source. Therefore the 107 user can tell at a glance whether the pair is working or spare, and if working whether it is in use. Also if the meter reads at the R mark when the RING/TIP switch is in TIP, and at the T mark in RING, then the pair or the test leads are reversed. Refer to Figure 14.1 for meter markings.

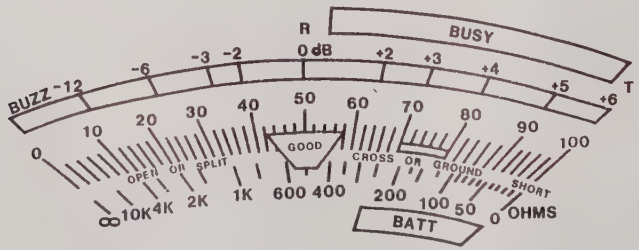

Figure 14.1

14.03 Testing Vacant Pairs

On vacant pairs that are have no defects and no terminations, the meter will read zero for all positions of the RING/TIP and SHORT/GND switches. A reading other than a meter kick means that there is a resistance fault on one or both sides of the pair. A full scale (100) reading means that the fault is solid and can probably be located in the OHMS mode. A part scale reading means the fault is high resistance. Refer to Table 14.1 for the resistance value for various meter readings. This mode is very sensitive to high resistance faults and is excellent for detecting moisture problems. In general any reading greater than 10 indicates a service affecting problem. Readings between 0 and 10 mean a leakage of between 1 and 10 million ohms which may or may not be significant.

TABLE 14.1

Test Mode Meter Reading	Resistance
100	0 ohms
90	11 kohms
80	25 kohms
70	43 kohms
60	67 kohms
50	100 kohms
40	150 kohms
30	233 kohms
20	400 kohms
10	900 kohms
0	>10 megohms

In the TEST mode a meter reading can be caused by pure resistance or by voltage or a combination. If it is unclear which is present, switch to the VOLTS mode and check for voltage. If no voltage is present, then the reading is due to a resistive fault.

14.04 Kick Test

The TEST mode can also provide a ballistic kick test to check for cable length and the presence of telephones. This test is very similar to that performed by many test board facilities. The kick test is performed on vacant lines or working lines with the battery removed by switching the RING/TIP switch between RING and TIP repeatedly. The SHORT/GND switch must be in SHORT for this test. The meter will then "kick" to a value dependent on the length of the pair and the number of stations present. Refer to Table 14.2.

TABLE 14.2
KICK TEST READINGS

Meter Kick	Approximate Capacitance	Approximate Pair Length*	No. of Stations**
2	.015 mf	950 feet	--
4	.033	2100	--
6	.047	3000	--
8	.059	3750	--
10	.068	4325	--
20	.15	9500	--
30	.22	14000	--
40	.32	20000	--
50	.42	27000	--
60	.57	36000	1
70	.67	43000	1
80	.84	53000	1
90	1.04	66000	2
100	1.17	75000	2

* Pair length is based on a mutual capacitance value of .083 mf per mile.
** Based on a 500 type telephone with a .45 mf ringer capacitor and a ringer equivalency (REN) of 1.0. Refer to 20.07 for more information on telephone location.

15. USING THE OHMS FUNCTION

15.01 The OHMS mode is used to measure the resistance of shorts, crosses and grounds; and once the resistance is known, the distance to the fault can be easily determined. The ohms scale on the meter is calibrated from 0 to infinity (∞), and is designed to provide the most accurate readings in the 0 to 2000 ohms area. Faults higher than 2000 ohms are high resistance and cannot be located anyway.

15.02 Measuring Shorts, Crosses and Grounds
First determine the resistance of the fault using the OHMS function and the ohms scale on the meter. Then for shorts and crosses multiply the ohms reading by the following factor to determine the number of feet to the fault.

Wire Gauge	26	24	22	19
Multiply Ohms Reading By	12	20	30	60

For grounds, use the same factor except double the resultant footage.

Example: If the meter reading in ohms to a short is 25 ohms and the cable is 22 gauge wire, multiply 25 ohms by 30 (the factor shown above for 22 gauge) to obtain a distance of 750

feet to the short. If the fault were a ground instead of a short, the distance would be 1500 feet.

15.03 Aluminum Wire
For 20 gauge aluminum wire, use the 22 gauge factor (30); and for 17 gauge aluminum, use the 19 gauge factor (60).

15.04 Temperature Considerations
Distance to short readings will be different from those shown above if the cable temperature is much different from 68oF. For temperatures above 68°F, decrease the distance by 2% for each 10°F above 68. For temperatures below 68°F, increase the distance 2% for each 10°F below 68.

15.05 Other Factors
Distance to short readings will also be affected by gauge changes, load coils, bridge lifters and repeaters between the measuring point and the fault. It is best to eliminate these variables if possible. If not possible, the user must estimate the distance by calculating the change each of these factors will cause. Gauge change effects can be estimated by taking a reading in each gauge and interpolating between the measurements depending on the length of each gauge. 88 mh load coils will add about 8.5 ohms to the reading, and 66 mh coils will add about 6.0 ohms. Likewise, bridge lifters will add 20 ohms and E6 Repeaters will add about 60 ohms.

16. USING THE CAP FUNCTION

16.01 Purpose
The CAP function is used to measure the length of unterminated vacant pairs and to measure opens and splits. The cap circuit measures the capacitance of cable pairs using a DC pulse technique that provides a steady meter reading that is directly proportional to the length of the pair. It is similar to the kick test but is much more accurate. A careful operator can locate opens to within ±2% with the 107 cap function. Since the meter reading in the CAP mode is directly proportional to the pair length, the only problem is to calibrate the circuit to a known length. The following paragraphs describe how this is accomplished.

16.02 Calibration (10,000 feet)
The CAP circuit can be calibrated with a known capacitor that is built into the unit and represents exactly 10,000 feet of wire (assuming standard capacitance cable). To select this capacitor, select the CAL position on the OLD PAIR SELECT switch. Then place the function switch in CAP and the OLD/NEW switch in OLD. Use the CAP ADJ knob to set the meter reading exactly on 100. It may take several turns of the knob to set the meter. Now the cap circuit is calibrated to read 100 on 10,000 feet of cable. Therefore a

reading of 60 would represent 6,000 feet, 25 would represent 2,500 feet and a reading of 10 would represent 1,000 feet. Similarly, the meter can be set to read 50 on 10,000 feet of cable, so a reading of 100 would mean 20,000 feet,60 would mean 12,000 feet, and 25 would mean 5000 feet. This would be useful if the pairs were between 10,000 and 20,000 feet in length.

16.03 Calibration (100,000 feet)
The Cap circuit can also be calibrated to read 100,000 feet full scale by simply turning the CAP ADJ knob fully counterclockwise until it starts to click. Now the meter is automatically set to read 100 on 100,000 feet of cable, so a reading of 60 means 60,000 feet, 25 means 25,000 feet and 10 means 10,000 feet. To check the calibration of this setting, select the CAL capacitor and note that the meter reads 10.

This setting is also used to check for the prescence of a telephone instrument on a vacant line. A standard telephone will look like an extra 20,000 feet of cable. Refer to 20.07. In testing for a telephone, the SHORT/GND switch is left in the SHORT position.

16.04 Calibration (known cable length)
Another method of calibrating the Cap circuit is to set the meter to read a known cable length on a good pair. For example, if you know that a certain cable is 6,300 feet long, connect to a good pair and use CAP ADJ to set the meter to a reading of 63. Now when measuring a defective pair, the meter will read the length directly. For example, a reading of 47 would mean 4700 feet.

16.05 IMPORTANT
When measuring pair length or opens with the Cap function, always take readings with the SHORT/GND switch in GND. Thus each side of the pair is measured independently, and on a one side open, one side will read shorter than the other. The 10,000 foot calibrate capacitor and the 100,000 foot setting are both set up for readings in the GND position only. Readings taken in the SHORT position will be very inaccurate.

16.06 Measuring Opens
The following is a step-by-step procedure to measure an open conductor.

1. Connect the ground cord to the cable shield and set the function switch to CAP.

2. Switch the OLD PAIR SELECT to CAL and make sure the OLD/NEW toggle switch is in OLD. Use the CAP ADJ knob to set the meter reading to exactly 100.

3. Select the pair to be tested and with the SHORT/GND switch in GND, read the length of each side of the pair. The meter is calibrated to read 10,000 feet full scale so a reading of 42 means 4,200 feet, 65 means 6,500 feet, etc.

4. If the meter pegs (reads greater than 100), turn the CAP ADJ knob several turns counterclockwise until it clicks. The meter will now read 100,000 feet full scale, so a reading of 42 means 42,000 feet, 65 means 65,000 feet, etc.

16.07 Normal Pair Readings

Another use for the Cap function is to determine whether a pair is balanced or has any defects. Any defects such as opens, shorts, grounds, crosses, splits, excess bridge tap, or high resistance faults will affect the reading in the Cap mode. Telephone cable pairs all have a set relationship between the mutual (ring to tip) capacitance and the capacitance from one side to ground. On most cables the capacitance to ground is 1.5 times the mutual capacitance. This relationship holds true on any length pair. Therefore on any good cable pair, if the meter is adjusted to read 50 in the SHORT position, the ring and tip sides will each read approximately 75 (50 times 1.5) in the GND position. This means that any pair can be tested for all defects by simply setting the meter to 50 in SHORT and then verifying that both ring and tip sides read between 70 and 80 in GND. Note that the meter is marked in green around the 50 and between 70 and 80 to show where a normal good pair reads.

16.08 Analyzing Defects

Table 16.1 can be used as a guide to analyzing defects when the meter has been set to read 50 in SHORT on a good pair.

TABLE 16.1
CAP READINGS

When meter is set to 50 in SHORT on a good pair

Defect	Reading In SHORT	Reading in GND RING	TIP
Good Pair	50	70-80	70-80
Short	100+	100+	100+
Ring Ground	>50	100+	70-80
Tip Ground	>50	70-80	100+
Ring Open	<50	<70	70-80
Tip Open	<50	70-80	<70
Both Side Open	<50	<70	<70
Ring Cross	>50	>80	70-80
Tip Cross	>50	70-80	>80
Split	<50	70-80	70-80
Bridge Tap	>50	>80	>80

Notes: > means greater than
< means less than
100+ means the meter is pegged to the right

16.09 Locating Splits

The 107 Cap circuit can be used to get an approximate location of splits. The following procedure is very easy to use and will work even if only one of the split pairs is known. It will also work on splits involving more than two pairs. This procedure will not work on split and resplit pairs although it will show the percentage of the pair that is split.

1. When a split pair is encountered, the meter will read less than 50 in SHORT, usually between 40 and 50. To determine whether the pair is open or split, simply switch from SHORT to GND. If the ground reading is less than 70 on one or both sides, the pair is open. If the ground reading is between 70 and 80 on both sides, the pair is split.

2. To determine the approximate location of the split, switch back to SHORT and carefully note the meter reading. This meter reading shows the percentage of the pair that is not split. In most cases a pair that is split for 100% of its length will read about 40. Therefore a pair that is split for 50% of its length will read about 45, a pair that is split for 20% of its length will read 48, a pair that is split 70% of its length will read 43, etc. This means that if you obtain a reading of 43 on a pair that you suspect is split, and you are measuring from the non-split end, then the split will be located 30% of the total cable length away from your location. For example if your total cable length was 5,000 feet and the meter reading was 43 on a split, the split location would be 30% or approximately 1500 feet from your location. Refer to Table 16.2 for meter readings vs. distance to split.

TABLE 16.2
SPLIT LOCATION

Meter Reading	Distance To Split
40	Very Close
41	10% of total cable length
42	20%
43	30%
44	40%
45	50%
46	60%
47	70%
48	80%
49	90%
50	Not Split

3. IMPORTANT
Table 16.2 will only apply if a 100% split reads 40 on the meter. If the meter reads much different than 40 on a full length split, then the readings must be interpolated between the full length split reading and 50 instead of between 40 and 50. This is easy to check by simply taking a few readings between two rings or two tips of any good pairs. If these readings are much different from 40, the same method can be used but the new low reading must be used instead of 40. For example if full length splits read 35 instead of 40, and you obtain a reading of 42 on your split pair, then your split will be 42 minus 35 or 7 divided by 15 (50 minus 35) which is 47% of your total length. Although this sounds complicated when you write it down, just remember that you can visually estimate the distance to a split by simply noting how much the meter reading changes when you measure a good pair, a full length split and the actual split.

This method of split location may not be as accurate as some others, but it is much easier to use and will give useful information about where to start looking.

16.10 Non-Standard Cable Measurements
The location of open pairs described above and the calibration of the Cap circuit are based on standard capacitance cables with a mutual capacitance of .083 mf per mile. If non-standard cable types are being measured, the distance readings must be multiplied by the correction factor shown in Table 16.3. For cable types not shown in this table, the correction factor must be determined by measuring a known cable length. The split location procedure is <u>not</u> dependent on cable capacitance values so the correction factors do not apply to the split location procedure.

16.11 Load Coils and Build-out Capacitors
The Cap circuit in the 107 will read through load coils with no problem. Each load coil will add about 6 feet to the reading obtained, plus the length of the stub. Build out capacitors will add directly to the cable capacitance readings so these must be subtracted in some cases.

16.12 Rapid Pair Testing
Another use for the Cap function is to perform a rapid pair test on spare lines for all physical defects. With the meter reading in SHORT set to 50 on a good pair, all other pairs can be rapidly tested by simply switching through them and noting that the meter reading does not change. With the 50 pair access, 50 pairs can be tested in a minute or so for all types of defects. On most PIC cables, the reading will stay between 46 and 54 on good pairs. On pulp cables, the reading may vary between 44 and 56 on good pairs. The readings will vary less on long cables than on short ones.

With a little experience a tester can identify cable troubles very accurately with this method.

TABLE 16.3
Non-Standard Cable Factors
(for open location only)

Cable or Wire Type	Multiply Reading by this Factor
Lo Cap Cable	2.0
MAT Cable	1.23
B-service (2 pr)	.62
C-service (2 pr)	.73
C-service (5 pr)	.76
C-drop (1 pr)	.70
C-multiple (6 pr)	.41
D-inside (6 pr)	.83
D-inside (25 pr)	.67
D-station (24 gauge)	.79
D-station (22 gauge)	.76
D-rural (6 pr)	1.24
E-buried (1 pr)	1.03
F-drop (1 pr)	1.03
F-multiple (6 pr)	.92
F-service (2 pr)	.60
F-service (5 pr)	.58
JKT-station (2 pr)	.46

17. BUZZ FUNCTION DESCRIPTION

17.01 "Buzz" is the term commonly used to describe the process of verifying that the old pair and the new pair are electrically tied together in the central office by a "half tap." Buzzing is normally done in the field at the time of a cable transfer, and may consist of something as simple as placing a short on one pair and watching a meter change readings on the other pair. All Throwmasters have had the capability to perform the buzz function without interrupting service, even on busy lines. However this procedure has become more difficult with the advent of subscriber loop carrier systems. With subscriber loop carrier (SLC) lines, there is no physical circuit between the old and new pairs, and therefore simple techniques like shorting a pair no longer work. Some methods like dialing the ANI code number and verifying the telephone number seem to work at first glance but may only verify one side of the pair. The 107 incorporates a buzz method that offers 100% verification of half tap between the old and new pair, and does it in the least interfering way. The new buzz method for SLC lines does apply an audible tone on the line for a tenth of a second which is audible to the subscriber. Therefore the 107 retains the silent buzz method used in the 106-25 and

102A model Throwmasters for use on metallic circuits. In the 107, either the silent buzz method for metallic circuits can be selected or the new buzz method for derived pair or pair gain lines can be selected. The toggle switch labeled METALLIC/DERIVED(PG) is used to select the buzz method desired.

17.02 Metallic Buzz

The metallic buzz circuit is very similar to that used in the 102A and 106-25. The 107 sends a silent simplex tone on the new pair. A circuit on the old pair "listens" on the ring and tip alternately. If the half tap is run properly and the cable pair has no defects, equal tone will be heard on the ring and tip and the user will hear a steady tone. If the half tap is missing or is run to the wrong pair, no tone will be heard. If only one side of the half tap is run properly or if one side of the pair is open or grounded, then the tone will be heard only one half the time causing a "beeping" sound. Any unbalance on the old pair, the new pair or the half tap will cause a beeping or warble tone. If the new pair is reversed with respect to the old pair, a polarity sensing circuit will turn off the tone entirely. The tone level is displayed on the meter and by noting this level, it is possible to separate the individual circuits on four wire circuits. This buzz method is the same for vacant, idle, busy or special circuits. All the splicer has to remember is -- NO TONE, NO CUT.

17.03 Derived or Pair Gain Buzz

The term "derived" refers to the fact that pairs operating out of pair gain systems are derived from the electronics of the carrier system instead of being metallic circuits from the central office. Tones and supervisory signals can be sent through the carrier systems only if the systems are designed to accept such signals. Simplex tones and grounded tones will not be recognized by most carrier systems therefore they cannot be used to verify continuity or half taps. Short circuits will be recognized by the carrier system as an off-hook condition but the tip side of the pair is not verified by using a short as a test condition. The 107 operates by seizing a channel on both the old and new pairs, and then sending a verification tone that is recognized by the carrier system. The level of the verification tone is sensed which confirms that the correct pair is selected and that both the ring and tip conductors are the correct ones.

This method also verifies that the electronics in the carrier system is working properly. And finally the direction that the tone is sent can be reversed which verifies proper transmission in both directions through the electronics.

18. METALLIC CABLE TRANSFERS

18.01 Step by Step Procedure

The following is a step-by-step procedure describing how to perform cable transfers using the metallic buzz method. This method is recommended for cable pairs that are metallic all the way from the central office to the throw location. If preferred the other Derived (PG) method can be used on this type of transfer as well. Refer to paragraph 19.

1. Connect the ground cord to the cable shield and place toggle switches in the following positions:
   RING/TIP in RING, SHORT/GND in SHORT,
   METALLIC/DERIVED(PG) in METALLIC,
   OLD/NEW in OLD, BUZZ DIRECTION in either*,
   ID/OFF/BUZZ in OFF and all
   BDG/OFF/TEST in OFF

*The Buzz Direction switch has no effect in Metallic buzz.

2. Connect the black cord to the old pair and the white cord to the new pair; or connect the appropriate test cords to the old and new count Cinch connectors. In connecting the black cord, always connect to the field side of the splice so that when the pair is cut the cord will be connected to the field.

3. Select the BLK or pair 1 position on the OLD PAIR SELECT switch. Use BLK for single pair throws and the pair number for modular 25 pair throws.

4. Select the BUZZ position of the function switch and note the meter reading. A normal idle pair will read at the R mark on the meter (about 50). If the old pair is reversed, the meter will read 100+. If the line is busy the meter will read in the BUSY area. If the pair is vacant, the meter will read 0. The meter will also read 0 if one or both sides of the test cord is not making contact.

Note: The buzz circuit does not care if the old pair is reversed as long as the new pair is reversed also. If the meter reads 100+, do not reverse the leads or switch the RING/TIP switch to TIP. The buzz circuit will still perform a test even if the meter is pegged.

The purpose of this step is primarily to verify that the old pair cord is making contact on both sides. Any reading other than 0 shows that contact is being made and that the pair is working. On a vacant pair, switch between RING and TIP and check the meter kick to make sure you are connected to both sides.

5. Select the new pair by switching the WHITE CORD-BDG/OFF/TEST switch to TEST or by pressing down the pair 1 toggle in the NEW PAIR SELECT group. If the REV LED comes on at this time, the new pair is reversed with respect to

the old pair. Check the cord connections. If the cords are connected properly, then the pair or the half tap is reversed and the problem must be corrected before the pair is bridged. Bridging a reversed pair will short the pair.

6. Press down the ID/OFF/BUZZ switch to send the verification tone. A steady tone should be heard and the meter will automatically switch from reading voltage on the pair to reading the level of the verification tone. Using the BUZZ ADJ knob adjust the meter reading to a setting of 50. Note that it is necessary to hold down the BDG/OFF/TEST switch when using the 25 pair cords and 25 NEW PAIR SELECT switches. Since it may be inconvenient to have to hold down both the NEW PAIR SELECT switch and the ID/OFF/BUZZ switch at the same time, it may be desirable to place the ID/OFF/BUZZ switch in the ID position which is not a momentary position. In this position the buzz tone will be applied automatically whenever a new pair is selected.

7. Before buzzing the rest of the pairs or throwing the first pair, it is important to perform a simple test to verify your ground connection. If the ground cord is not connected to a good ground it may be possible to buzz any pair with any other pair and get a good buzz indication. To test the ground, connect the white cord to any other pair in the group and repeat step 6. No tone will be heard if the ground connection is good. If pair one will buzz with any other pair, then the ground connection is no good. When using 25 pair cords instead of the white cord, perform the same test by pressing down any other NEW PAIR SELECT switch. Again no tone should be heard on any other pair.

8. Once the first pair is tested that pair may be bridged by placing the BDG/OFF/TEST switch in the BDG position. On single pair transfers, the pair is then cut and transferred before proceeding to the next pair. On 25 pair transfers, the first pair is left bridged and the rest of the pairs are tested and bridged in turn. On single pair to module transfers, the old and new pairs cannot be bridged unless the single pair cords are used.

9. To test the next pair, select the next old pair or connect the black cord to the next old pair to be tested. Note a proper meter reading,select the new pair and send the verification tone. If a solid tone is heard and the meter gives a steady reading then the pair is half tapped properly. In the metallic buzz mode the actual meter reading is not important. This reading may vary depending on whether the pair is idle or busy and what type of equipment is connected. The important test is whether a solid tone is heard and the meter reading does not fluctuate more than a couple of divisions on the meter scale. If no tone is heard or a beeping tone is heard, switch back to TEST and verify that the proper voltage readings are present

on the old pair. If the old pair looks good, switch the OLD/NEW switch to NEW and look at the new pair. If either the old or new pair does not have voltage, it may be desirable to measure the pair length using the Cap function. This will tell you whether the pair is continuous back to the central office.

If both the old and new pairs have proper voltage readings, but no tone, then either the half tap is not in place or it has been run to the wrong pair. To check for a half tap run to the wrong pair, place the ID/OFF/BUZZ switch in the ID position and clip the white cord to the other pairs in the group. If the old pair is half tapped to one of the new pairs in the same group, the verification tone will be heard when that pair is tested. If the 25 pair test cords are being used, the same test can be made by holding down the NEW PAIR SELECT switch and rotating the OLD PAIR SELECT thumbwheel switch through the rest of the pairs. Again the tone will be heard on another pair if a half tap is run to the wrong pair. Another choice would be to send an identification tone on the old pair and probe for the tone in the new cable.

Continue testing until all the pairs in the first group are buzzed and bridged.

Note: Once the old and new pairs are bridged together through the test set the old pair may be cut or the old module separated without interrupting service to the subscribers. Service is now being provided through the Throwmaster so do not remove the test cords until the pair has been respliced the new way.

10. At this point it is possible to verify the location of the telephone equipment in most cases. If the pair is not in use, switch the BDG/OFF/TEST switch back to OFF. This will remove office battery from the old pair and the Throwmaster will be looking at the field side of the splice which should be the copper pair to the subscriber's location and the telephone equipment. Now with the function switch in TEST and the SHORT/GND switch in SHORT, you can verify that the phone is to the field by switching between ring and tip. This will perform a kick test to the field and the meter will kick to at least 60 if there is a telephone present. If no phone is connected to the field, only the normal line kick will be observed. If the customer picks up his telephone during this test the meter will swing to full scale and service can be immediately restored by switching back to BDG.

Note: On some types of telephones with electronic ringers, the kick may be very small. Refer to 20.07 for detection of these phones. Also if the subscriber has disconnected his telephone or his ringer, you will not be able to see his

instrument. If a network termination unit (NTU) is installed at the protector, the 107 can be used to verify its presence, and thus the location of the telephone.

If the line in question is busy, then you can either wait until the party hangs up to perform this test, or you can momentarily switch from BDG to OFF and back to BDG. If the meter goes to the right (upscale), then the telephone is to the field of your location. If the meter goes to the left (downscale), then the phone is towards the office from your location. This procedure will momentarily interrupt service, so use with caution.

11. Return the BDG/OFF/TEST switches to the BDG postion and resplice or reconnect the pairs the new way.

12. Now place the BDG/OFF/TEST switches in the OFF postion and verify that the meter readings on each pair are back to normal.

13. As a final check for telephones left on the office side of the transfer point, many splicers have the coils pulled on the old count and use the Throwmaster to check for left in stations before closing the splice. This test can be done rapidly by using the Cap circuit and the 100,000 foot calibration setting. In this mode a standard telephone set will read 20,000 feet or more.

18.02 Four Wire Circuits

The only difference in throwing four wire circuits is that it is difficult to tell which pairs go together. When sending tone or tagging the pairs, tone will be heard on two pairs because of the connections in the central office. The meter reading in the Buzz mode is used to tell the difference between the two pairs. Leaving the old cord connected to the same pair, connect the new pair cord to or select with the NEW PAIR SELECT switches both of the new pairs that have a high tone level. Carefully note the meter reading in each case. The meter is more sensitive to differences if the needle is in the lower half (0-50) of the scale. The proper new pair or the one that goes with the old pair selected, is the one with the higher meter reading. The difference may be very slight, but there will always be some difference. The pair that reads the highest is the correct pair.

18.03 Number 5 Crossbar Offices

In #5 crossbar offices, this buzz method will not work because of the tip ground on all idle pairs. All pairs will beep as if they had only one side connected. Use the Derived (PG) buzz method on pairs working out of #5 crossbar offices, because this method makes the pair busy and eliminates the tip ground.

18.04 Ground Start Lines
On ground start lines the ring will have normal voltage but the tip will look open until a ground is applied to the ring side and the pair is made busy. On ground start lines use the Derived (PG) buzz method since it will hold the line after the ground is applied with the GND START switch.

19. DERIVED PAIR (PG) CABLE TRANSFERS

19.01 Step by Step Procedure
The following is a step-by-step procedure describing how to perform cable transfers using the Derived (PG) buzz method. This procedure is recommended for any pairs that are working on the field side of a subscriber line carrier or other pair gain facility. This method can also be used on all metallic facilities and is easier to use in most cases. The drawback to this method is that it uses a short test beep on each pair which is audible to the subscriber on busy lines.

1. Connect the ground cord to the cable shield and place toggle switches in the following positions:
    RING/TIP in RING, SHORT/GND in SHORT,
    METALLIC/DERIVED(PG) in DERIVED(PG),
    OLD/NEW in OLD, BUZZ DIRECTION in NEW>OLD,
    ID/OFF/BUZZ in OFF and all
    BDG/OFF/TEST in OFF

2. Connect the black cord to the old pair and the white cord to the new pair; or connect the appropriate test cords to the old and new Cinch connectors.

3. Select the BLK or pair 1 position on the OLD PAIR SELECT switch. Use BLK for single pair throws and the pair number for modular 25 pair throws.

4. Select the BUZZ position of the function switch and note the meter reading on the first pair. The meter is now reading the old pair. A normal idle working pair will read at the R mark on the meter (about 50). If the old pair is reversed the meter will read 100+. If the line is busy the meter will read in the BUSY area. If the pair is vacant the meter will read 0. The meter will also read 0 if one or both sides of the test clip are not making contact. If the pair is vacant, switch between ring and tip and observe the meter kick to check that both sides are making contact.

Note: The buzz circuit does not care if the old pair is reversed as long as the new pair is reversed also. If the meter reads 100+, do not reverse the leads or switch the RING/TIP switch to TIP. The buzz circuit will still perform a valid test even though the meter is pegged.

If the pair is busy, go to another pair if possible. Remember that this buzz method will cause a short duration

tone to be applied to the pair that will be audible to the subscriber.

5. Select the new pair by switching the WHITE CORD-BDG/OFF/TEST switch to TEST or by pressing down the pair 1 toggle switch in the NEW PAIR SELECT group. If the REV LED comes on at this time, then the new pair is reversed with respect to the old pair. Check the cord connections. If the cords are connected properly, then the pair or the half tap is reversed and the problem must be corrected before the pair is bridged. Remember that bridging a reversed pair will short the pair.

Also at this time the meter reading will fall to 0 and dial tone will be heard over the built-in speaker if the pair is working. If the pair is busy the conversation will be heard over the speaker. This circuit will load the pair just like an extension phone, so the subscriber may notice a slight drop in level when a busy pair is accessed. Listen to the dial tone and make sure it does not sound garbled or have a lot of noise. If it does the pair may have a ground or unbalance and should be tested further.

The green ACCESS LED will also come on indicating that the new pairs is working and that access has been achieved.

6. Press down the ID/OFF/BUZZ switch to send the verification tone. The verification tone will sound like a short beep that is louder than the dial tone. Also the meter will read the tone level. Although the tone is of very short (about 0.1 sec) duration the meter will hold the reading for several seconds. Use the BUZZ ADJ control to adjust the meter to a reading of 0 dB in the middle of the green area. If the ID/OFF/BUZZ switch is held down for several seconds the tone will be applied continuously making the meter adjustment easier. This adjustment is made on the first pair tested and does not usually require resetting. Now change the position of the BUZZ DIRECTION switch from NEW>OLD to OLD>NEW and press down the ID/OFF/BUZZ switch again. The meter reading should stay in the green area and this step verifies that transmission is good in both directions.

The meter scale for the derived pair buzz test is marked in green, yellow and red, indicating the normal readings for good and bad buzz tests. Refer to Figure 14.1. The green area is at 0 dB ±2 dB. A pair which gives a reading in this area will always be a good pair with a good half tap and good transmission through the electronics. A reading in the yellow area between +2 and +3 or between -2 and -3 is a borderline case and should be retested to see if the reading changes. If the reading stays in the yellow area, the pair should probably be retested later and the electronics in the hut should be checked. A reading in the red area which is

more than 3 dB from the normal reading, is a defective pair, half tap, or electronics problem and the pair should not be thrown until the cause is found and corrected.

The meter reading and the position of the BUZZ ADJ pot shows the tone level received on the old pair after being sent out on the new pair at a level of 0 dBm. Table 19.1 shows the total signal loss for a 0 dB meter reading for each setting of the BUZZ ADJ pot. For example, if the meter reads 0 dB and the BUZZ ADJ pot is set to 4, then the tone level received is -5.9 dBm and the total loss through both the old and new pair circuits is approximately 5.9 dB. This information is not necessary to perform a buzz test but is available if needed for other purposes.

Note: The ground connection is not as critical in this buzz method as in the metallic buzz method. Although a ground connection is reqired for proper voltage readings, it will not affect the buzz readings.

TABLE 19.1
BUZZ ADJ POT SETTINGS VS. SIGNAL LOSS

POT SETTING	SIGNAL LOSS
1	2.7 dB
2	4.7
3	5.4
4	5.9
5	6.4
6	7.0
7	8.0
8	9.8
9	14.4
10	23.0

7. Once the first pair is tested, that pair may be bridged by placing the BDG/OFF/TEST switch in the BDG position. On single pair transfers, the pair is then cut and transferred before proceeding to the next pair. On 25 pair transfers, the first pair is left bridged and the rest of the pairs are tested in turn.

8. To test the next pair, connect the black and white cords to the next old and new pair, or select the next old pair with the OLD PAIR SELECT switch. Then select the next new pair with the appropriate BDG/OFF/TEST switch, verify dial tone and send the verification tone. The meter reading should fall in the green area. Change buzz direction and send the tone again. Bridge that pair and repeat until all the pairs are tested and bridged.

Note: On busy pairs, it is best to set them aside and test them later when they are no longer busy. If that is not

possible (i.e. it's time to close up), then you can buzz the pair either by monitoring both the old and new pairs and confirming that the same conversation is heard on both, or you may send the verification tone anyway which will be audible to the subsciber but will only be one short beep. The meter reading will be about 3 dB lower than normal on a busy line. On busy lines only verify with the BUZZ DIRECTION switch in the NEW>OLD position as this will minimize the tone heard by the subscriber.

On pairs that do not buzz properly, use the CAP, TEST or OHMS functions to isolate and locate the problem.

If a pair will not buzz at all, and you suspect that the pair may be incorrectly half tapped, you can send an identification tone by accessing the new pair and placing the ID/OFF/BUZZ switch in the ID position. This causes a tone to be sent continuously on the new or old pair depending on the position of the BUZZ DIRECTION switch. NEW>OLD sends tone on the new pair, and OLD>NEW sends tone on the old pair. This tone will be solid instead of interrupted and since it is applied between the ring and tip instead of to ground, it will be harder to pick up with an amplifier, but you will be able to check the other pairs to see if the tone is present. Remember that no type of tone can be sent over a pair gain system unless a channel is established, which is what the 107 does for you.

9. Once the old and new pairs are bridged together through the test set, the old pair may be cut or the old module separated without interrupting service to the subscribers. Service is being provided through the Throwmaster so do not remove the test cords until the pairs have been respliced the new way.

At this point it is possible to verify the location of the telephone equipment in most cases. If the pair is not in use, switch the BDG/OFF/TEST switch back to OFF. This will remove office battery from the old pair and the Throwmaster will be looking at the field side of the splice which should be the copper pair to the subscriber's location and the telephone equipment. Now with the function switch in TEST and the SHORT/GND switch in SHORT, you can verify that the phone is to the field by switching between ring and tip. This will perform a kick test to the field and the meter will kick to at least 60 if there is a telephone present. If no phone is connected to the field, only the normal line kick will be observed. If the customer picks up his telephone during this test the meter will swing to full scale and service can be immediately restored by switching back to BDG.

Note: On some types of telephones with electronic ringers, the kick may be very small. Refer to 20.07 for testing for

these phones. Also if the subscriber has disconnected his telephone or his ringer, you will not be able to see his instrument. If a network termination unit (NTU) is installed at the protector, the 107 can be used to verify its presence, and thus the location of the telephone.

If the line in question is busy, then you can either wait until the party hangs up to perform this test, or you can momentarily switch from BDG to OFF and back to BDG. If the meter goes to the right (upscale), then the telephone is to the field of your location. If the meter goes to the left (downscale), then the phone is towards the office from your location. This procedure will momentarily interrupt service, so use with caution.

10. Return all BDG/OFF/TEST switches to the BDG position and resplice or reconnect the pairs the new way.

11. Now place all BDG/OFF/TEST switches in the OFF position and verify that the meter readings on each pair are back to normal.

12. As a final check for telephones left on the office side of the transfer point, many splicers have the coils pulled on the old count and use the Throwmaster to check for left in stations before closing the splice. This test can be done rapidly by using the Cap circuit and the 100,000 foot calibration setting. In this mode a standard telephone set will read 20,000 feet or more.

19.02 Ground Start Lines

On ground start lines, the ring side will have normal voltage but the tip will look open until a ring ground is applied. When a ground start line is accessed in the Derived (PG) mode of operation, no dial tone will be heard until the DID CKT/GND START switch is momentarily switched to the GND START position. Once dial tone is heard, the pair may be buzzed in the normal way.

19.03 DID Circuits

The DID CKT switch in the 107 is used to supply battery to activate Direct Inward Dial or DID circuits if battery is not already present. DID circuits will look like normal lines <u>if</u> the PBX is connected and is supplying battery to the RT. In this case 107 will verify the pair in the normal way and the DID CKT switch is not used. If the PBX is not yet connected, then no battery will be present and the meter will read open in one direction and will show a resistance leak in the other direction. In this case the 107 must supply battery to activate the card in the RT. To supply battery to a DID card the DID CKT switch must be held in the "up" position. No dial tone will be heard but the pair can then be verified in the normal manner.

Note: The method just described will work when the card in the remote terminal (RT) of a SLC 24 or 96 Carrier System is a WP43 SPOTS DPT Channel Unit S9CD275AXX or equivalent. When the card in the RT is a WP42 DPO Channel Unit, then battery will be supplied by the card and the DID switch will not be needed.

19.04 Four Wire Circuits
Four wire circuits may be buzzed in the same way as normal lines except that two pairs will have an audible verification tone. One will read slightly higher on the meter however and this will be the correct pair.

19.05 Urban Systems
DMS-1 Urban systems operate differently than most SLC systems in that they operate on 28 volts instead of 50 volts. This will cause the Throwmaster voltage readings to be different and they will not line up on the R, T and BUSY areas. Operation will be the same however and once the operator becomes familiar with the normal ring and tip readings, he will have no problem telling busy or reversed lines. Also the buzz dB readings through an Urban system will be slightly different each time the same pair is accessed and tested. This is normal and will not affect the operation of the 107. Good pairs should still read in the green.

19.06 Dry Circuits
The Derived(PG) buzz circuit uses the voltage on the old and new pairs to activate the buzz test. If the pair to be tested is dry, that is, it has no voltage present, then the green ACCESS LED will not come on and the verification tone will not be sent unless the ID/OFF/BUZZ switch is placed in the ID position or held in the BUZZ position for several seconds. After several seconds the verification tone will be applied continuously and the meter will show the tone level.

20. OTHER USES

20.01 As a Switching Device
The 107 can be used as a switch for accessing multiple pairs. For example an automatic pair identifier field unit can be connected to the DIAL OR TEST terminals and with the 107 in the OFF/VOLTS position, 25 or 50 pair can be connected to the Cinch connectors for test access. The OLD/NEW switch, the OLD PAIR SELECT switch and the 25 NEW PAIR SELECT switches are then used to access each pair in turn. In the OFF/VOLTS position the 107 will place a 100k ohm load across each pair or to ground depending on the position of the SHORT/GND switch. This should not affect a pair identifier or most other test equipment.

20.02 Monitoring Pairs
The speaker in the 107 can be used to monitor working pairs in the Derived (PG) Buzz mode only. In this mode the old or new pair selected will be made busy and monitored depending on the position of the BUZZ DIRECTION switch. As labeled, that switch will monitor the old pair in the NEW>OLD position and the new pair in the OLD>NEW position. The OLD/NEW switch should be left in OLD. Remember that this monitor is not a high impedance monitor and the subscriber may hear a drop in level if the pair is busy. If a high impedance monitor is desired, use a dial set in the Monitor position and connect across the DIAL terminals.

20.03 Dial or Test Terminals
It is important to remember that the DIAL OR TEST terminals are always connected to the pair being tested no matter which function is being used. Do not leave anything connected to these terminals while making measurements. These terminals are connected to the old or new pair depending on the position of the OLD/NEW switch.

20.04 Rapid Pair Testing
As mentioned in the section describing the Cap circuit, the 107 can be used for rapid testing of vacant pair groups for such purposes as acceptance testing and testing modular splice connections as they are made. 25 or 50 pair can be connected to the 107 and a rapid test for all DC defects can be made in the Cap mode with the meter set to 50 or any convenient setting. As long as all pairs read the same then they are all the same length and have no defects.

20.05 Sending Tone On Pair Gain Systems
If you are on the field side of a pair gain system and you wish to send an identification tone back to the central office on a particular pair, you cannot simply go to the tone mode and apply the tone to the metallic pair. There is no channel available to carry the tone unless the pair is working and is made busy. Also the pair gain system will not recognize any tone except one that is applied between the ring and tip -- as opposed to between the ring and/or tip and ground. The 107 enables you to do this by simply placing the black cord on the pair or selecting the pair with the OLD PAIR SELECT switch, and placing the ID/OFF/BUZZ switch in the ID position. A short beep will be sent followed in a few seconds by a continuous tone. The function switch must be in BUZZ and the BUZZ DIRECTION switch must be in OLD>NEW. To send tone on the new pair, do the same thing but place the BUZZ DIRECTION switch in NEW/OLD.

This tone will be solid instead of interrupted and will be harder to hear than a normal ID tone because it is only between the ring and tip, but it will be possible to pick it up in the central office on the correct pair. Most other tone sources cannot be used for this purpose.

20.06 Verifying Telephone Numbers
In many central offices an ANI code number can be called which will return the pair telephone number via a recorded voice. The 107 can be used as an access point for this function and the DIAL OR TEST terminals can be used to connect a dial set to dial the code number and listen to the number.

20.07 Testing For Telephone Sets
The 107 can be used for checking for the prescence of telephone sets on any line that has no battery present. This test can be made with the kick test as described in 14.04 or with the Cap function as described in Section 16. When using the Cap function the meter should be calibrated as described in 16.03 with the CAP ADJ knob fully counterclockwise. With this setting a normal phone with a Ringer Equivalence Number (REN) of 1.0 will read about 20,000 feet in addition to the line length. If the subscriber has more than one phone, then this reading will be higher for each phone.

Many of the newer electronic telephones have solid state ringers and have REN's of less than 1.0. This means they will look like less than 20,000 feet of additional line. In fact if they have a REN of 0.1, than they will look like only 2,000 feet of extra line. Therefore when checking for the prescence of telephone ringers today it is important to know the actual cable length you are testing. Thus if you know that you are looking at 3500 feet of cable and you find a line that reads 5500 or more, there is probably a telephone on that line. Because of these new phones, it is preferable to use the Cap test instead of the kick test since it is a more accurate test.

GOOD LUCK AND PLEASE CALL (817) 325-9461 IF YOU HAVE ANY QUESTIONS.

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